# KEEPING TIME

By C. F. TALMAN
*Of the United States Weather Bureau*

*MENTOR GRAVURES*

THE GREAT CLOCK, STRASSBURG, GERMANY

TIME SERVICE ROOM AT UNITED STATES NAVAL OBSERVATORY, WASHINGTON

PULPIT TWO-HOUR GLASS, HAND-CARVED

SUN-DIAL Set in the wall of a house in Rhode Island

*MENTOR GRAVURES*

WATCH-TESTING CABINET, U. S. BUREAU OF STANDARDS

ASTRONOMICAL CLOCK AT UNITED STATES NAVAL OBSERVATORY, WASHINGTON

MATHER SUN-DIAL, PRINCETON, N. J.

MODERN civilized man finds it difficult to imagine a state of human society without accurate methods of keeping time. We live by the clock. We consult it anxiously on rising in the morning, mindful of the fact that at a certain fixed hour we are due at the breakfast table, and that another precise moment of the day should find us beginning our work. Our tasks and our pleasures are carefully measured out in hours and minutes. Even seconds have their importance—as, for example, when it is a question of catching a train. Time-saving—which implies exact time-keeping—has become a mania with us; resulting, no doubt, in the promotion of efficiency, but also, alas! in the wearing out of nerves and the spoiling of manners.

Yet Greece and Rome were civilized nations before the invention, not only of clocks and watches, but also of minutes and seconds—and even, one might say, of hours, since the "hours" known to classical antiquity were of quite variable length. For centuries after mankind had acquired laws and systems of government, graphic and mechanical arts, and many other things that pertain to an orderly existence, ideas concerning intervals of time were extremely vague, because no accurate means of measuring them had been discovered.

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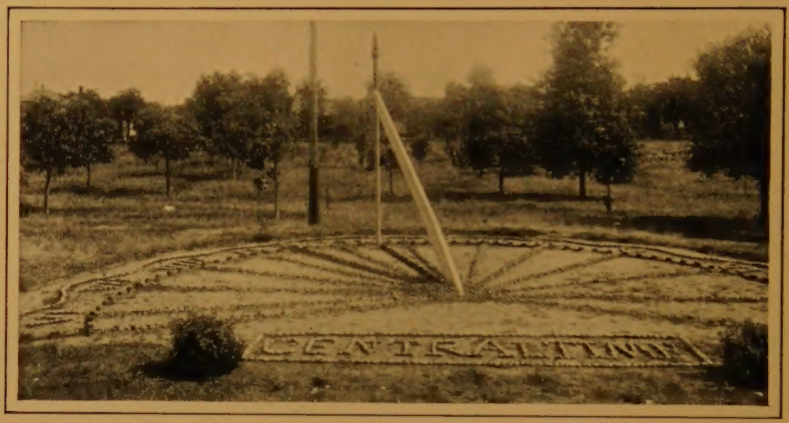
MODERN SUN-DIAL



SUN-DIAL ON LAWN AT DODGE CITY, KANSAS
Showing Central Time. Standard Time changes from Central to Mountain Time at Dodge City, the difference being one hour

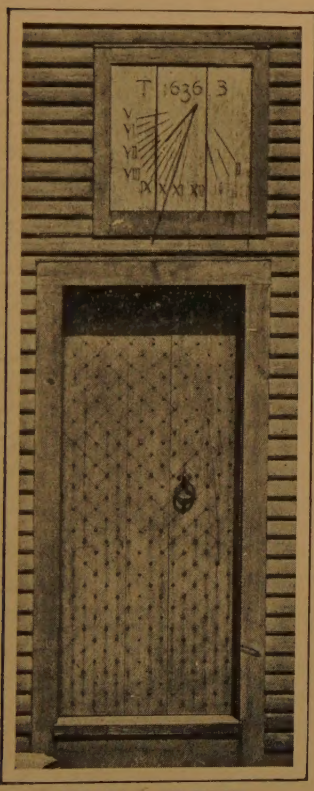
A BEAUTIFUL SUN-DIAL
At the home of Horace J. Smith, Esq., Germantown, Pa.

## *The Origin of Time-Keeping*

It is hardly an exaggeration to say that Nature knows nothing of uniform intervals of time. Periodic natural phenomena are rarely punctual in their recurrence. The most famous geyser in Yellowstone Park, "Old Faithful," derives its name from the fact that ever since its discovery, in 1870, it has spouted approximately once an hour; but the actual time between its performances is anywhere from 60 to 75 minutes. The nearest approach to an accurate natural measure of time of which we have any knowledge is the rotation of the earth on its axis, and our whole modern system of time-keeping is based on the *assumption* that the period of this rotation is absolutely uniform; yet astronomers have a strong suspicion that it is not. The friction of the tides is thought to be responsible for a gradual slowing up of this movement, though the retardation, if it exists, is so excessively minute that it may be disregarded, not only for practical but also for most scientific purposes.

Of course primitive man knew nothing of the rotation of the earth; much less did he know that the earth is a relatively small body revolving around an immensely distant sun. Concerning the real movements of the heavenly bodies he was completely ignorant, but their *apparent* movements early impressed themselves on his attention, and gave rise to conceptions of time that, with minor modifications, prevail to the present day. In the light of modern knowledge, the methods of time-keeping that we have inherited from our ancestors seem rather absurd. Without unduly anticipating explanations that are to follow,

SUN-DIAL ON LAWN AT DODGE CITY, KANSAS
Showing Mountain Time



SUN-DIAL OF WOOD
Set above the nail-studded door of solid wood of an old New England house

From Todd's Astronomy
SUN TIME
"Sun time" differs in different longitudes on account of the curvature of the earth's surface
(See page 10)

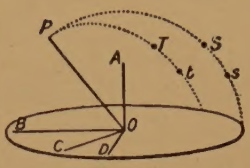


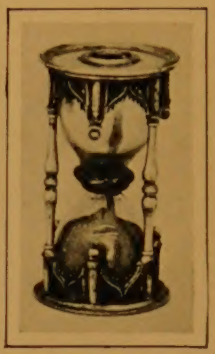

DIAGRAM
Showing principle of the sun-dial (see page 5).

we may assume the reader to be familiar with the fact that when, according to local modes of reckoning time, it is noon in New York City, it is midnight on the opposite side of the globe. In other words, an identical moment of time is *called* noon in one place and midnight in another. Perhaps the day will come when this paradox will be abolished for all purposes, as it has already been abolished by astronomers and mariners, whose clocks and chronometers all keep the time of Greenwich, and are therefore alike all over the world.

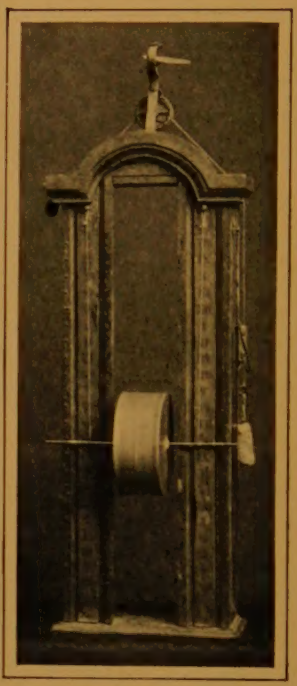
The paradox arose from the fact that man got his first idea of measuring time from the apparent movement of the sun across the sky. The sun was seen to rise in the east and set in the west, and to attain its highest point in the heavens when it had run half its course and stood due south of the observer. We now know that, since the world is round, these events occur at different times in different longitudes; but our forefathers were only concerned with the fact that local sunrise and sunset were the limits within which most of their own occupations were confined, and that local midday was a convenient intermediate landmark.

Thus the daylight *day*, from sunrise to sunset, was the first time interval to be recognized by man; and even among the Greeks and Romans, at the height of their civilization, this period, known as the "natural

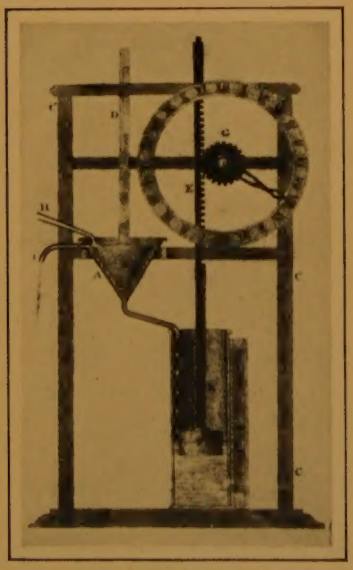
day," was considered much more important than the "civil day," which corresponded to our modern day of twenty-four hours. Now it is a well known fact that, except at the equator, the length of the daylight period varies with the season. In summer we observe that the sun rises and sets farther north, and remains longer above the horizon, than in winter. Hence when man began to divide the natural days into parts, these parts also varied in length with the season. In the time of Homer only three parts were recognized—morning, midday, and afternoon. Later the morning and the afternoon were each divided in half. Finally, with the introduction of sun-dials and water-clocks, the natural day was divided into twelve "hours," and these hours were, of course, longer in summer than in winter. At Rome the length of an "hour" was only 44 minutes at the time of the winter solstice, when the days are shortest, while it was 75 minutes at the summer solstice. Hours of uniform length throughout the year were never in common use in ancient Greece and Rome, though they were known to the ancient astronomers. Such hours were, however, generally used by the Egyptians.



FRENCH HALF-HOUR GLASS
Of the eighteenth century. In the Metropolitan Museum of Art, New York City



A CLEPSYDRA
Or water clock. In the United States National Museum at Washington



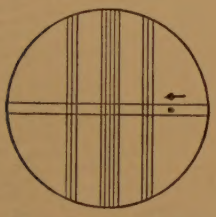
ANCIENT CLEPSYDRA
Or water clock

The evolution of the longer intervals of time, such as weeks, months and years, belongs to the history of the *calendar*, which we must reserve for a future number of The Mentor, as our present space is limited.

## *Early Artificial Time-Keepers*

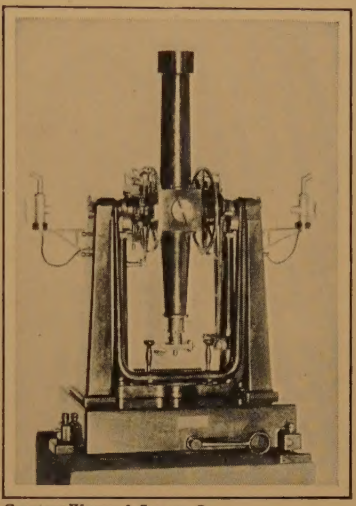
The simplest artificial time-keeper is a perpendicular column, the shadow of which, under the light of the sun, varies in length with the time of day, being shortest at noon and longest at sunrise and sunset. This is a form of sun-dial, and is sometimes called a *gnomon* (a name also applied to sun-dials in general, or to the pointer which casts the shadow on the face of the dial).

The gnomon is a poor time-keeper. The direction in which its shadow falls at midday is constant throughout the year—hence it constitutes a useful "noon-mark"—but at other hours the direction of the shadow depends upon the season of the year as well as upon the time of day. This is illustrated in the diagram on page 3, where *AO* represents the gnomon, and *P* is the north pole of the sky; that is, the point around which all the heavenly bodies, including the sun, appear to revolve once a day, in consequence of the rotation of the earth. *OB* is the shadow cast by the gnomon at midday, and is in the same position whether the sun is in its low winter position, *s*, or its high summer position, *S*. At any other time, however, such as nine o'clock in the morning, the shadow lies in the direction *OC* if the sun is in its winter position, *t*, but in the direction *OD* with the sun in the summer position, *T*. If, instead of making our column perpendicular, we incline it in the direction *OP* (parallel to the earth's axis), the position of the shadow at a given hour will be the same throughout the year. By this expedient we convert the gnomon into the more useful and familiar form of *sun-dial*. The staff of the sun-dial, which casts the shadow, is called the "style." It must be given an inclination depending upon the latitude in which it is to be used. The higher the latitude the more nearly its position must approach the perpendicular. Sun-dials with inclined styles were well known to the ancients, who also sometimes used dials in which the shadow was cast into a bowl-shaped cavity instead of upon a flat plate.



STAR CROSSING THE FIELD OF THE TRANSIT INSTRUMENT

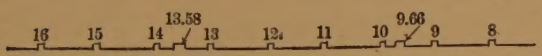
As each "spider line" is crossed, the observer presses a key, thus making a mark on the record sheet of the chronograph



Courtesy Warner & Swasey Co.

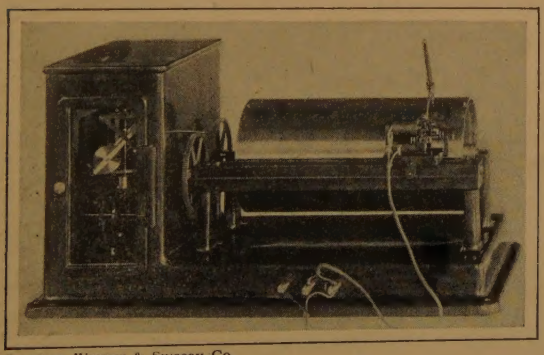
FOUR INCH COMBINED TRANSIT AND ZENITH TELESCOPE

An instrument for getting time from the stars




SPECIMEN CHRONOGRAPH RECORD

The notches at regular intervals are recorded each second by the clock. Marks registered by the observer are seen between the ninth and tenth and between the thirteenth and fourteenth seconds

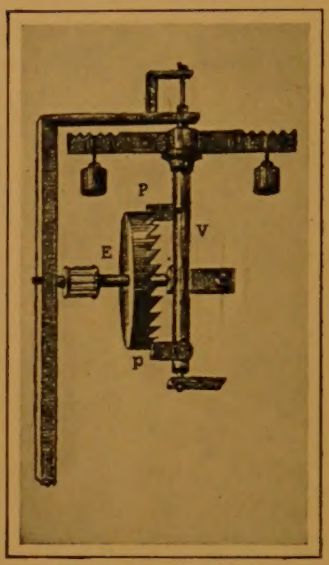


Courtesy Warner & Swasey Co.

STANDARD CHRONOGRAPH

When in use, a sheet of paper is rolled around the cylinder, which is turned by clockwork. A slight lateral motion of the pen causes it to trace an endless line, on which little notches are made every second by an electrical contact in the clock that is being compared

The earliest sun-dial of which we have any record is mentioned in a Chinese manuscript of about 1100 B. C. The "dial of Ahaz," referred to in the Bible (ii. Kings xx, 11, and Isaiah xxxviii, 8), probably belongs to the eighth century B. C. The Greeks learned the use of sun-dials from the Babylonians in the sixth century B. C., while the first sun-dial erected in Rome was among the spoils captured from the Samnites in 290 B. C. Another was brought from Sicily in the year 263 B. C. This dial, having been constructed for use in a more southerly latitude, was not an accurate time piece in its new location; but so little did the Romans understand such instruments that the error was not detected for nearly a century.




VERGE ESCAPEMENT
With "Foliot" balance
(See page 8)

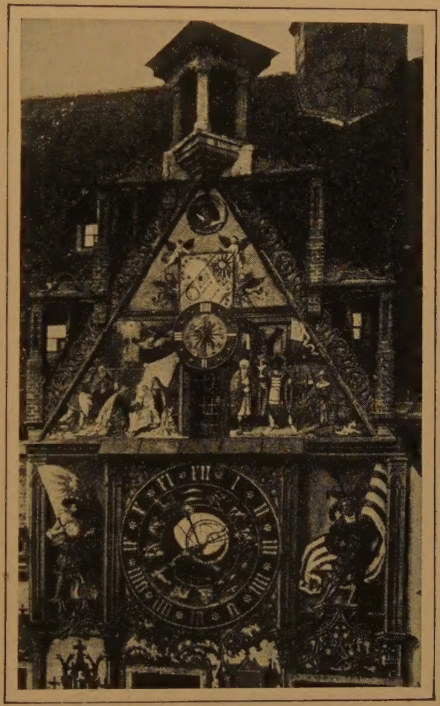
*Water-clocks*, or *clepsydras*, are of great antiquity. Public clocks of this character were used by the Assyrians as early as 640 B. C., and they were known in Greece in the fifth century B. C. The clepsydras commonly used by the ancients were of simple design, consisting of vessels of various shapes from which the water was allowed to run out slowly through small holes in the bottom. The amount of water discharged furnished a rough indication of the time elapsed since the flow began. These devices are most frequently mentioned by classical writers in connection with their use in the law-courts to limit the time of speakers. Julius Cæsar refers to their use in Roman camps to measure the four watches into which the night was then divided. The extent to which clepsydras were used instead of sun-dials for showing the hour of day is uncertain. They possess the obvious advantage over the latter that they can be utilized at night and in cloudy weather, and it was for this reason that a public clepsydra was set up in Rome in the year 159 B. C., but neither sun-dials nor clepsydras played anything like the important part in the daily life of the Greeks and Romans that clocks and watches do in that of modern mankind.

TYPICAL HOUSE CLOCKS
Terry clock in the center, Willard clocks on each side

Descriptions have come down from antiquity of several elaborate forms of clepsydra, equipped with wheels, pointers, and the like, and with devices for taking account of the different length of the hours at different seasons of the year, but none of these appear to have been in *general* use.

The use of clepsydras and sun-dials continued through the Middle Ages, even after the invention of modern timepieces. In the seventeenth century water-clocks were sometimes equipped with pendulums. The art of "dialling," or constructing sun-dials (and even moon-dials!) was assiduously cultivated down to the end of the eighteenth century; in short, until clocks and watches became so cheap that sun-dials could be dispensed with altogether, except for artistic purposes.

The *hour-glass*, or *sand-glass*, is similar in principle to the simple form of clepsydra; sand being substituted for water. The invention of this device is ascribed to one Luitprand, (loo'-it-prand) a monk of Chartres (shartr), who lived in the eighth century A. D. King Alfred the Great, of England, is said to have used burning candles, graduated with marks an inch apart, for keeping time. A more recent device involving a similar idea is a night-lamp, in which the time is shown by the level of the oil in the reservoir.



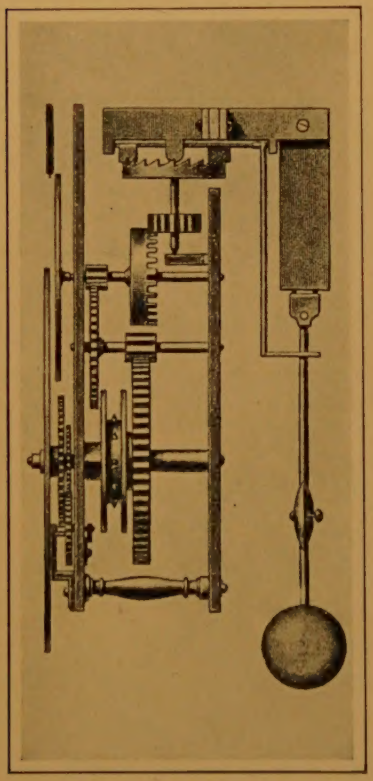
CLOCK ON THE TOWN HALL AT ULM, GERMANY
Constructed in the sixteenth century

## *Clocks and Watches*

The word "clock" is connected with the German "Glocke" and the French "cloche," (closhe) both of which mean "bell." The earliest clocks driven by weights were probably, in most cases, designed merely to strike the hour; the dial appears to have been a later improvement. The origin of weight clocks has been the subject of much controversy. Their history cannot be traced with any certainty farther back than the fourteenth century, during which Peter Lightfoot, in England, and Henry de Vick, in France, constructed timepieces that have come down to the present day.

In order that a clock or a watch may run at a uniform speed it must be provided with an attachment serving as a brake upon the motion of its wheels, and two principal devices—the *balance* and the *pendulum*—have been employed for this purpose. Between this regulating device and the train of wheelwork is introduced an ingenious piece of mechanism called the *escapement*. It is the escapement which makes a timepiece tick.

For about three centuries after weight clocks were invented their regulating attachment consisted of a rude form of balance, called the *foliot*, connected with the clock by a *verge escapement*. These are shown in the design on page 6. The vertical rod, or *verge*, *V*, is suspended so that it may turn freely. At its summit it bears a cross-bar, from which two weights are hung, while from the surface of the rod project two small flanges, or *pallets*, *P*, *p*, set nearly at right angles to each other. *E* is the *escape wheel*, which is connected with the main wheelwork of the clock, and therefore turns under the action of the descending weight. (The wheelwork and weight are not shown here.) The teeth of this wheel engage the pallets alternately, causing the cross-bar to swing back and forth, and the latter, in turn, by its momentum, serves as a check on the movement of the escape wheel, and hence the main clockwork. The amount of resistance offered by this device to the working of the clock may be varied by shifting the weights along the cross-bar.

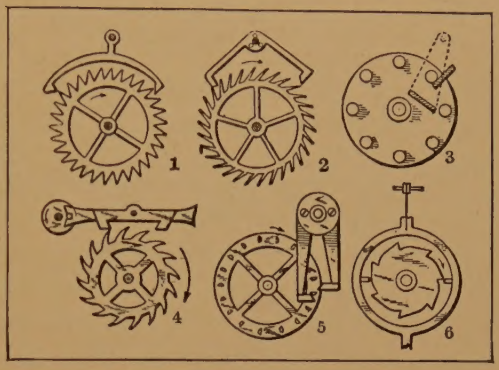


HUYGENS' PENDULUM CLOCK
About 1656

A revolution in clock-making was brought about by the invention of the *pendulum*. The fact that a weight swinging from a fixed point makes its swings at perfectly regular intervals, and that the time occupied by these swings (if we disregard a trifling variation with latitude) depends solely upon the distance of the weight from the point of support, was discovered by Galileo, who—as every schoolboy has heard—was led to this discovery by observing the swinging of a lamp in the cathedral at Pisa (pee′-sa). This was in the year 1581, but it was not until more than half a century later that the principle was successfully applied to the regulation of clocks. Who made the first pendulum clock is uncertain, but this achievement is commonly ascribed to Christian Huygens, the Dutch philosopher, who published an account of such clocks in the year 1658.

The transition from the foliot balance to the pendulum is a comparatively easy one. In the diagram of the verge escapement, page 6, imagine the verge to be set in a horizontal position, and one of the arms of the cross-bar to be eliminated. The remaining arm will now hang vertically and constitute a pendulum, the swings of which are controlled by the force of gravity, and are almost independent, as to speed, of the driving force of the clock. Huygens' (hei-genz) clock is shown in the accompanying

picture. In order to lessen friction, the pendulum, we notice, is no longer hung on the axis that carries the pallets. Subsequent improvements in the pendulum have been especially in the direction of freeing it from disturbances due to changes of temperature. Expansion by heat lengthens a pendulum, and hence, according to the principle discovered by Galileo, increases the time of its swing; but this effect can be offset in various ways, one of which is to use for the weight or "bob" a jar of mercury. This liquid expands upward as the pendulum elongates, thus keeping the center of gravity in the same place.




CLOCK AND WATCH ESCAPEMENTS

1. Recoil escapement. 2. Dead-beat escapement. 3. Lantern-wheel escapement. 4. Lever escapement. 5. Pin-wheel escapement. 6. Ring escapement.

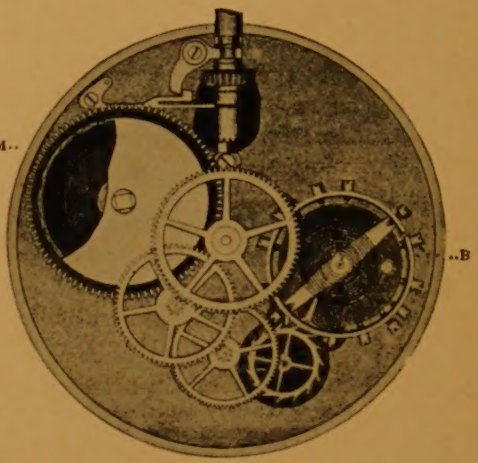
Greater improvements have been made in the escapement. It would be impossible to describe here all the forms of this device that have been introduced for clocks and watches. Several are shown in the annexed figure.

About the end of the fifteenth century clocks began to be made in which a coiled spring was used as the driving force, in place of a descending weight. This invention is attributed to Peter Hele (hay'-lay), of Nuremberg, who utilized his invention in the production of the first pocket clocks, or watches. The early watches were provided with verge escapements, and were very poor time-keepers, because as the spring uncoiled and its driving force diminished, the vibrations of the foliot, or balance, grew slower. Several devices were introduced to remedy this difficulty, but the problem was not fully solved until the invention of the *balance-spring* by Robert Hooke, about 1658. This contrivance is exemplified in the hair-spring of the modern watch. The tension of the spring controls the vibration of the *balance-wheel*, just as the force of gravity controls the vibrations of a pendulum. While the balance-spring is constantly striving to bring the balance-wheel to rest, the driving-force of the mainspring, acting through a train of wheels and the escapement, keeps it in motion. The speed of this motion depends upon the shape and weight of the balance-wheel and the tension of the balance-spring, and so long as these are kept constant, the timepiece runs at a uniform rate.

From Britten, "Old Clocks and Watches."

"JACK, THE SMITER," SOUTHWOLD CHURCH, ENGLAND

A time beater of the early fifteenth century




WATCH MOVEMENT
M, mainspring. B, balance-wheel, with hair-spring

The balance-wheel and its spring are even more affected by changes of temperature than is a pendulum, and must therefore be "compensated." When the temperature rises, the balance-spring is lengthened and its elasticity is diminished, while the balance-wheel would, but for the compensating device, increase in size. The effect of both these changes would be to make the watch run slower. Now glance at the accompanying diagram of a watch "movement" (the name applied to the moving parts collectively) and notice the balance-wheel *B*. The rim of this wheel is made of two strips of metal, brass outside and steel inside. It is also broken at two points, so as to allow free expansion. Under the same change of temperature brass expands much more than steel, but as the two strips are securely fastened together, the effect of changing the temperature is to change the curvature of the rim. With an increase of temperature, this change in the shape of the rim diminishes the diameter of the wheel and thus alters its momentum just enough to offset the retarding effect due to the weakening of the spring.

Lastly, the rim is pierced with a number of screw-holes. Into some, but not all of these holes are inserted the large-headed screws seen in the diagram. In the original adjustment of the watch these screws are moved about from one hole to another, until their weight is so distributed as to give the balance-wheel exactly the right rate of vibration.

The balance-wheel of a watch makes 18,000 vibrations each hour, and travels about 18 miles a day.

## *The Principles of Modern Time-Keeping*

We have not yet altogether abandoned the primitive notion that the position of the sun in our own skies should determine the time of day. The figure on page 3 shows why, at one and the same instant, it is nominally 9 o'clock at one place, 10 o'clock at another, and 11 o'clock at a third. The dotted line shows, in each case, the direction of the sun, but not its distance, which should be more than a hundred thousand times as great as here drawn, in order to be in proportion to the rest of the diagram.

The sun is, however, a poor time-keeper, for more reasons than one. If we note the interval between two successive passages of a star across our "meridian" (the north-and-south line drawn through our place of observation), we shall find that it is always the same, but this is not true of the sun. Owing partly to the varying speed of the earth's revolution around the central luminary, and partly to other causes, the sun is

sometimes "fast" and sometimes "slow" with respect to a clock running at a uniform rate. It is for this reason that the time shown by a sun-dial ("apparent solar time") generally differs a little from that shown by a clock ("mean solar time"). This difference is called the *equation of time*, and when greatest amounts to about sixteen minutes. On only four days in the year do the clock and the sun-dial agree. Nowadays, mean solar time is generally obtained from the stars, and not from the sun. The meridian passage of stars whose position is accurately known is observed by means of a *transit instrument*, and, as the stars are always on time they furnish a means of determining whether our clocks are equally faithful.

THE LARGEST CLOCK IN THE WORLD

Dial 38 feet 5 inches in diameter. Colgate Building, Jersey City, N. J.

But even if the sun were as punctual as the stars he would only give us correct *local* time. The traveler would need to alter his watch with every change in longitude, and such was, in fact, the situation before the introduction of *standard time*. According to this system, the world is divided into longitudinal zones averaging 15 degrees in width (their actual boundaries are modified in this country to suit the convenience of the railways, and in Europe to fit political frontiers), and within each zone the time is uniform, being just an hour faster than in the next zone to the west, and just an hour slower than in the next zone to the east.

The starting-point in this system is the mean solar time of the Royal Observatory at Greenwich, the meridian of which is taken as the center of the first time zone. When it is noon at Greenwich it is 7 A. M., standard time, at New York and Washington, 6 A. M. at St. Louis and Chicago, 5 A. M. at Denver, and 4 A. M. at San Francisco. In other words, the readings of standard time clocks in different time zones throughout the world differ by whole hours, and agree as to minutes.

A new complication in time-keeping was introduced in the year 1916, when several European countries adopted the expedient of keeping their clocks an hour faster in summer than in winter; not, as has been commonly stated, in order to hoodwink people into the belief that they were getting up at seven o'clock when it was really six, but for the sake of securing a better utilization of daylight, with a minimum confusion in nominal time schedules.

## *SUPPLEMENTARY READING*

OLD CLOCKS AND WATCHES AND THEIR MAKERS *By F. J. Britten*

SUN-DIALS AND ROSES OF YESTERDAY *By Alice M. Earle*

TIME AND CLOCKS *By H. H. Cunynghame*

TIME AND ITS MEASUREMENT *By J. Arthur*

THE STORY OF TIME *By A. B. Olston*

THE BOOK OF SUN-DIALS *By Mrs. A. Gatty*

***Information concerning the above books may be had on application to the Editor of The Mentor.

# THE OPEN LETTER

The Mentor Clock is striking its last for nineteen hundred and sixteen. Twelve strokes sound—one for each month of the Old Year.

*One, two, three*—the first months pass before us, and we recall the Ring of the Nibelung, the Golden Age of Greece, and the War of 1812.

*Four, five, six*—the strokes bring back the memory of Masters of the Violin, Pioneer Prose Writers, Old Silver, and Shakespeare's country.

*Seven, eight, nine*—the summer numbers come to mind; Gardens of New England, The Weather, and American Poets of the Soil.

*Ten, eleven*—echoes start of the Yosemite Valley, and South America; then the figures of Walter Scott, John Paul Jones, of Raphael and Rembrandt, and Russian Masters of Music stand before us.

*Twelve*—another Mentor year is completed; a year of happy, hopeful endeavor and rapid, substantial growth. And now with a number on Keeping Time, we extend a hearty New Year greeting to our many members, and turn our faces toward the twelve months before us.

GRANDFATHER'S CLOCK
Of walnut inlaid with satinwood. Sheraton style. English make. Date about 1770

★ ★ ★

The year's promise is rich and full. The program for the coming twelve months is wide in scope and varied in interest. I can say this with conviction and a full heart, for it is what might be called a "Request Program." That means a great deal to me. It means that The Mentor members take a real, vital interest in our development—and show it by suggesting good, practical ideas for future numbers.

This very number, "Keeping Time," was suggested to us by an enthusiastic Mentor member. Another good friend suggested a full course on South America. Two of these numbers have already appeared, as you know,—Argentina and Chile. These will be followed during the coming year by numbers on Brazil and Peru. In answer to many requests, we shall publish a Mentor devoted to the Planets. And so, too, as the result of a suggestion, Mr. Mabie will give an account of the Literature of the South. When we published Mr. Talman's first article last summer on the Weather, several asked us for a Mentor on Earthquakes and Volcanoes. This will appear in July. Then in August we will continue the series of Mentors on the Great Rivers of the World. We have told the story of the Rhine and of the Danube. Professor Hart will tell the story of the Hudson, and later on the Mississippi and the Amazon.

The following suggestion from a member was most interesting. "So much fiction has been written," he said, "in which the primitive world life has been fantastically misrepresented, that it would surely be well for The Mentor to publish two numbers by some one of recognized learning, who would tell us some real facts about life in the world in prehistoric times." In response to this suggestion, we have prepared a Mentor on Primitive Life, in which the great prehistoric animals are pictured and described; and this will be followed by a number in which primitive man will be similarly treated—both by a well-known authority, and illustrated with pictures obtained from the New York Museum of Natural History.

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And these are but a few of the fine things planned for the future. Art, Travel, History, and Literature—all favorite departments—will be represented by many interesting and attractive numbers. The Mentor Plan grows bigger and broader every year, and the Mentor membership has much to do with the making of it.

W. D. Moffat

OHN LAWRANCE.

Y JOHN TRUMBULL

ctual size: 3¾ inches high.

IN THE POSSESSION OF

THE NEW YORK HISTORICAL SOCIETY

ONE

THE work of John Trumbull as a historical painter has already been considered in The Mentor (No. 45), and in that number, too, the main facts of his life are told. John Trumbull was a patriotic American and a leader in the artistic and public life of his day, both in England and in America. His position was much more than that of a painter. His attitude toward painting was not one of complete and whole souled devotion. "I am fully sensible," he wrote at one time, "that the profession of painting as it is generally practised is frivolous, and unworthy a man who has talents for more serious pursuits. But to preserve and diffuse the memory of the noblest series of actions which have ever presented themselves in the history of man is sufficient warrant for it." We see accordingly that John Trumbull's idea of the work of a painter was to *write history on canvas with a brush* —and his pictures bear out his idea.

His life governed and controlled his art. He was born in Lebanon, Connecticut, in 1756, a son of the Colonial governor of that State, and from early years he revealed a mental vigor that was extraordinary. He was an infant prodigy in learning. He entered Harvard College in the junior year at the age of fifteen, and the time he spent there was occupied in omniverous reading and study—which finally came near wrecking his health. When he was a student he visited the great painter John Singleton Copley, and became impressed with that great painter's idea of the dignity of an artist's life. He determined to study art, and he was learning to paint when the War of the Revolution began. This event determined the character of his art life. His skill in drawing being noted by General Washington, he was set to work making plans of the enemy's works. He was then promoted to a position on the general staff, and, afterward, served as colonel under Gates. But aggrieved at what he considered a tardy recognition of himself by Congress, he resigned from the army, went to England and there, meeting the distinguished artist, Benjamin West, took up under him the study of painting. When Major André was executed there was a spirit of retaliation aroused in England, and Trumbull was arrested and imprisoned as a spy. It was only the intercession of Benjamin West that saved his life. After seven months' imprisonment he was released, on condition that he leave the country. He did not leave, however, but continued his studies with West, and did not return to the United States until 1789.

And so we see that Trumbull's life was more that of a patriot than a painter. Art was not the controlling factor with him, but the servant. He devoted his brush to the commemoration of great historical events, such as the battles of Bunker Hill and Trenton. And when he painted portraits he selected the prominent patriotic figures in the public life of his time—Washington, Alexander Hamilton, and others of like importance.

There is not much of John Trumbull's work in miniature to be seen. The picture on the other side of this sheet has, therefore, a special interest. It is the property of the New York Historical Society, and is a portrait of an American statesman of Washington's time. John Lawrance was born in Cornwall, England, came to New York in 1767, was admitted to the bar and attained eminence there. During the Revolutionary War he was associated with General George Washington as aide-de-camp; and as judge-advocate-general he presided at the trial of Major André. He was a United States senator and served several times in Congress. He was an ardent patriot and a personal friend of both Washington and Hamilton. This picture was painted by Trumbull in Philadelphia in 1792.

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Actual size: 7 inches high, 6 inches wide.

COPYRIGHT, 1895, BY THE PROVIDENCE ATHENAEUM

IN THE PROVIDENCE ATHENAEUM

THE HOURS. By Edward G. Malbone

EDWARD GREENE MALBONE was born in Newport, Rhode Island, August 17, 1777, and died in Savannah in 1807. While a boy he frequently visited the local theater in his native town to watch the process of scene painting, and, later, tried his hand at this work—attaining what was considered by the townspeople great success. As a child he was quiet, reserved and self-absorbed. At sixteen he showed an indication of great talent in his first portrait miniature. Encouraged in his efforts by the English Consul at Providence, he devoted himself to the study of drawing heads and painting miniatures, and, at seventeen, he became professionally identified with miniature painting in Providence, and, in 1796, fairly established as a miniature painter in Boston.

In 1800 he accompanied his friend and fellow artist, Washington Allston, to Charleston, and the following year the two went together to Europe. It was during his stay in London that Malbone painted his most important miniature, "The Hours," now owned by the Providence Athenæum. This shows, at three-quarter length, the figures of three beautiful women, who represent, as the Greeks personified them, Eunomia, Dice (die'-see) and Irene—the Past, the Present and the Coming Hour. They have a general resemblance and seem as if they might represent the same individual in different moments of emotion and development.

On the left is seen Eunomia or the Past, with an expression of pensive reluctance rather than regret. The central figure is Dice, or the Present—looking straight out from the picture. Her right arm is slightly raised toward Eunomia, at the left, while the left hand reaches half deprecatingly toward the Coming Hour. Irene, or the Coming Hour, is shown leaning upon the left shoulder of the Present.

This miniature was given to his sister by the painter during his lifetime, and, later, was purchased from the family by the subscription of twelve hundred dollars for the Providence Athenæum.

Although urged by Benjamin West to remain in England, where his art would win him ample appreciation and employment, Malbone preferred to return to America, and on his arrival traveled for several years—stopping in the principal cities to paint miniatures. "These," to quote Tuckerman, "are among the few pleasant and precious artistic associations with the past in this country."

Ill health finally took Malbone to Jamaica, but finding that his illness was incurable he left there, with the intention of returning to New England, but died in Savannah—in the prime of his life and success—before he could reach the North. Malbone is now considered the most important of all miniaturists of his time.

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THE GOLDEN HOUR.

BY W. J. BAER

IN THE POSSESSION OF

actual size: 4 inches high, 5 inches wide.

COPYRIGHT, 1896, BY W. J. BAER

ART beckons and the artist follows. Only an artist knows what the lure of art is. The field of art is full of enticements. Little incidents, apparently insignificant, have sometimes been sufficient to change an artist's career and direct him toward his most brilliant achievements.

William J. Baer was thirty years of age before he painted a miniature. More than that, he had never seen a miniature that interested him, and he believed that miniature painting had limitations that precluded it from serious consideration. He was an instructor of drawing at Cooper Institute, New York City, an illustrator for magazines, and a painter of portraits, and had no thought of painting miniatures when, in 1892, he finished a very successful portrait of the late Alfred Corning Clark of New York. Mr. Clark was so pleased with the painting that he expressed a desire to have a copy of it in miniature. Mr. Baer did not believe that a result could be obtained worthy of the effort, so he refused to try it. Mr. Clark renewed his request, and Mr. Baer again refused. A short time after, however, having some leisure, his mind turned back to Mr. Clark's request, and, upon consideration, he was prompted to make a quiet attempt at miniature painting. He supplied himself with the necessary materials, and made his first experiment by copying a head from one of his own pictures, a profile of a young woman. The result was surprising to him—detail, patience, eyesight and hand served him well. In another week he had painted the miniature of Mr. Clark from his original sketch in oil colors. When Mr. Clark saw it he was delighted and asked for another. And so, out of what was at first a mere diversion, Mr. Baer developed a perfected art.

With the showing of Mr. Baer's miniatures at the First Portrait Show in 1894, his success was definitely assured.

In 1896 he painted his first ideal miniature, "The Golden Hour," now owned by Mr. Robert S. Clark of New York City. The idea of this exquisite picture developed from an effort of Mr. Baer's to paint in profile from memory the head of an auburn-haired girl that he had seen. A well-known English girl who had posed for Sir Edward Burne-Jones and Sir Frederick Leighton, happened then to call at his studio. Several sittings, in which a number of pencil and red chalk drawings were made, gave him an entirely different idea. The profile developed into a lovely dream picture, in which woman's crowning glory, her glowing hair, was poetically idealized. The picture shows two profiles, like twin sisters—the first with hair of dark copper tinge, the second at the left with hair of brilliant auburn, melting into the sunset colors of the sky.

This was the first of a number of ideal works by Mr. Baer, and was followed at intervals by others of like charm. "Primevera," painted in 1908, which is Mr. Baer's most important and ambitious endeavor, represents Flora, the handmaiden of spring, and is a delicate color poem.

Mr. Baer was born in Cincinnati, Ohio, on January 29, 1860. He studied art in Cincinnati and in Munich. He returned to America in 1885, and for several years was an instructor in various art institutions. In 1897 he received the first-class medal for miniature and ideal subjects in New York, and he was an organizer and a former president of the American Society of Miniature Painters. Mr. Baer is at present treasurer of that society and an associate of the National Academy.

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Actual size: 5¼ inches high, 4⅜ inches wide.

IN THE METROPOLITAN MUSEUM OF ART, NEW YORK CITY

MRS. BECKINGTON, BY ALICE BECKINGTON

ALICE BECKINGTON is one of the leading members of the American Society of Miniature Painters, and she now holds the office of vice-president. She was born in St. Charles, Missouri, on July 30, 1868. She was a pupil at the Art Students' League in New York under Carroll Beckwith—after that she studied in Paris with Benjamin Constant. Miss Beckington was a close friend of Miss Thayer's, and the work of the two shows a sympathetic understanding. Miss Beckington's work is serious, fine in taste, and dignified in character. She does not play lightly with her art. Her pictures have a pleasing warmth of color; that is to say, blacks and browns, golden flesh colorings, and grays that are never cold. Occasional cool effects are, however, to be found in her work, for Miss Beckington has a full appreciation of the value of harmoniously contrasting color. The picture reproduced on the reverse side of this sheet is taken from an original miniature in the Metropolitan Museum of Art. It is a portrait of Miss Beckington's mother, the original ivory plate being slightly smaller than the reproduction here given.

As may be seen, it is a work of distinction. The character of this refined woman is portrayed with simple eloquence. The pale blue of the dress and the delicately toned background set off in a poetic and sympathetic manner the character of this fine gentlewoman. The picture is thoroughly representative of Miss Beckington's work, and amply explains her high standing among our miniature painters. Just as many persons in social life who are assured in their exclusive positions dress simply and unaffectedly, so Miss Beckington paints—with directness and sincerity, without display or striving for effect.

Miss Beckington, referring to her early efforts in miniature painting, says that it was during the four years when she was working in oils in Paris that she became interested in miniature painting—and that in this work she was self-taught. Her first portrait of her mother was accepted by the Salon in Paris in 1894, and upon her return to New York she exhibited pictures annually at the National Academy. She believes that the great principles of art that obtain in oil painting should apply to miniature work as well; and she paints her miniatures in the same manner as she would paint in oils—with only the difference in treatment required by the conditions of a small sized picture.

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PERSIS,

BY LAURA COOMBS HILLS

IN THE METROPOLITAN MUSEUM

OF ART NEW YORK CITY

Actual size: 6¾ inches high, 5 1/16 inches wide.

LAURA COOMBS HILLS is a favorite of lovers of miniature painting. She has a fine, fresh style of her own. Her spirit is buoyant, natural, and without affectation. She is a craftsman of extraordinary talent. No difficulties seem to daunt her. Her coloring is positive, and she seems undismayed in rendering any tone of dress or background or face. Her painting of flesh color, particularly, is just and true. Temperamentally, Miss Hills must be counted as one of the soundest and truest of miniature painters, by which is meant that she looks at life with clear seeing eyes, and records what she sees truthfully and with sympathetic understanding. The accompanying picture, Persis, is a good example of Miss Hills' work. It shows a child with brownish-red hair, wearing a dark shade of pink ribbon. Her dress, of the faded pink variety, wherein the lights approach flesh coloring and the shadows are silvery, merges into golden tints. The background of sofa and tapestry offers a variety of greens throughout, with a note of clear orange in the bit of cushion to the left of the child's right arm. The floor and the arm of the sofa repeat the color of the hair. A few patches of blue and blue-green in the tapestry supply a relief for the colors of the figure and the cushions.

It was somewhat over twenty years ago that Miss Hills began to paint miniatures. Up to that time she had done some illustrating and decorative painting, worked on china, and some commercial designing. She was born in Newburyport, Massachusetts, September 7, 1859, and was a pupil of Helen M. Knowlton, of the Cowles Art School in Boston, and also of the Art Students' League in New York. She was in England on a visit when a girl friend of hers remarked on her work, and asked her why she did not turn her brush to miniature painting. Miss Hills was at first reluctant to attempt a new line of art. But after some consideration she got several pieces of ivory, persuaded some young girls to sit for her, and in a short time turned out seven miniatures. She was surprised to find how easy the work appeared to be. She had understood that miniature painting was difficult and required a special talent. She was not wrong about that, but until she undertook the work she was not aware that this special talent was hers. She was delighted. Her outlook was clear and full of promise. She had a work of beauty to do and she knew that she could do it well.

People interest Miss Hills, and the picturing of people, especially young people, is a delight to her. The people she paints are very real, and they are distinct and individual. She has painted over 200 miniatures, and they are something more than portraits. They have a pictorial quality that gives them a very special charm and distinction. It has been observed that if the subjects that she has pictured in her miniatures had been rendered in oils on large canvases, "they would be found decorative and impressive." Miss Hills was a member of the Society of American Artists in 1897, and was made an associate of the National Academy in 1906. She is a member of the Boston Water Color Club, Copley Society, New York Woman's Art Club, and the American Society of Miniature Painters. She has exhibited in several of the world expositions, and has received a number of medals for merit.

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Actual size: 5 inches high, 3 ¾ inches wide.

IN THE METROPOLITAN MUSEUM OF ART, NEW YORK CITY

PORTRAIT OF A CHILD. By Lucia Fairchild Fuller

THE miniature work of Mrs. Fuller, like that of Miss Thayer and Miss Hills, came close after that of Mr. Baer. These artists were each independent of the other, and in the history of the modern revival of miniature painting they stand simply as remarkable coincidences in taste and inclination.

ler's miniature work is full of intimate feeling, reflecting the charm of affectionately considered detail and giving out an impression that her subjects must have been near and dear to her. Her work is distinguished for its delicate grace and simple charm. The picture on the reverse side of this sheet is a portrait of a child—a very real child. The composition is beautiful in line as well as in pattern. The human interest predominates, without sacrifice of fine workmanship. It is not simply a "prettified" picture, such as we find so often in the shops and soon tire of. It is a work that attracts the painter, as well as the layman, by its sympathetic appeal. "Delightful!" we exclaim. A masterpiece of child life painting is this little girl in her "nightie" holding her doll. The coloring is tender and fine. The background is a pale blue, under which the baseboard and floor show a pale golden color, harmonizing with the child's blond hair. The little print on the wall also makes a "repeat" of the warm color.

Lucia Fairchild Fuller is the wife of the well known artist, Henry Brown Fuller. She was born in Boston on December 6, 1872. She was a pupil of Dennis M. Banker, and studied at the Cowles Art School and at Mrs. Shaw's in Boston—likewise with Siddons Mowbray, and William M. Chase in New York. As a member of the Society of American Artists she became an associate of the National Academy in 1906, and was likewise one of the founders of the American Society of Miniature Painters, of which she is now president. Her work has not only won popular appreciation, but has secured distinguished recognition in the form of medals awarded at various expositions in Paris and in the United States.

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